Space Weather Technical Forecast

Issued on Wednesday, 03 April 2024 at 01:16 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Active to G1 Minor Storm intervals likely into Day 1 (03 Apr) and early Day 2 (04 Apr) due to the expected arrival of the fast wind associated with CH16/CH17.

Analysis of Space Weather Activity over past 24 hour

Solar Activity: Activity has been Very Low with no significant solar flares. There are two main simple sunspot regions now on the disc; AR3625 having now rotated around the limb with AR3626 also fading to pores in the northwest. Very little activity on the current disk although signs of approaching regions beginning to round the eastern limb. These will be assessed as and when they become clearer.

No Earth-directed CMEs were observed in available imagery.

Solar Wind / Geomagnetic Activity: Ongoing weak fast wind conditions were observed, now most likely from CH13/+. Solar wind speeds measured by ACE/DSCOVR at L1 were generally steady at slightly elevated levels of around 420-480km/s. Density was around average. Total Interplanetary Magnetic Field (IMF), Bt was fairly steady at weak levels. The north-south component, Bz, varied weakly between +6/-5nT. Phi angle remained mostly positive (away from the Sun), with some negative variation. Geomagnetic activity was Quiet to Unsettled (Kp1-3).

Energetic Particles / Solar Radiation: High energy proton flux (greater than 10MeV) observed at GOES-18 was at background levels. High energy electron flux (greater than 2MeV) observed at GOES16 was at background levels. The associated 24-hour fluence remained below Active, with a value of 2.61e6 integrated pfu at 03/0000UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Low to Very Low activity is expected, but with a slight chance of isolated M-flares maintained given the unknown risk presented by approaching regions, this increasing by the end of the period.

Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs currently forecast. Current slightly elevated wind speeds, most likely due to positive coronal hole influence from CH13/+ look like to remain generally steady before the onset of a likely stronger coronal hole fast wind from negative polarity CH16/- and CH17/- expected later into Day 1 (03 Apr) with any enhancement expected to continue through Day 2 (04 Apr), perhaps gradually easing by Day 3 (05 Apr).

Geomagnetic activity is forecast to be initially Quiet on Day 1 but increasing into the day to become generally Active with a chance of G1 Minor Storm intervals due to the fast wind onset, this perhaps persisting into early Day 2, before gradually easing to Quiet to Unsettled with a chance of Active intervals.

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Met Office Space Weather Technical Forecast

Energetic Particles / Solar Radiation: High energy proton flux as observed by GOES18, is expected to be remain near background levels. High energy electron flux is expected to persist at background levels until after the next fast wind enhancement into Days 3-4 (05-06 Apr). The associated fluence will persist below the Active threshold, but with a chance of rising above by the end of Day 4.

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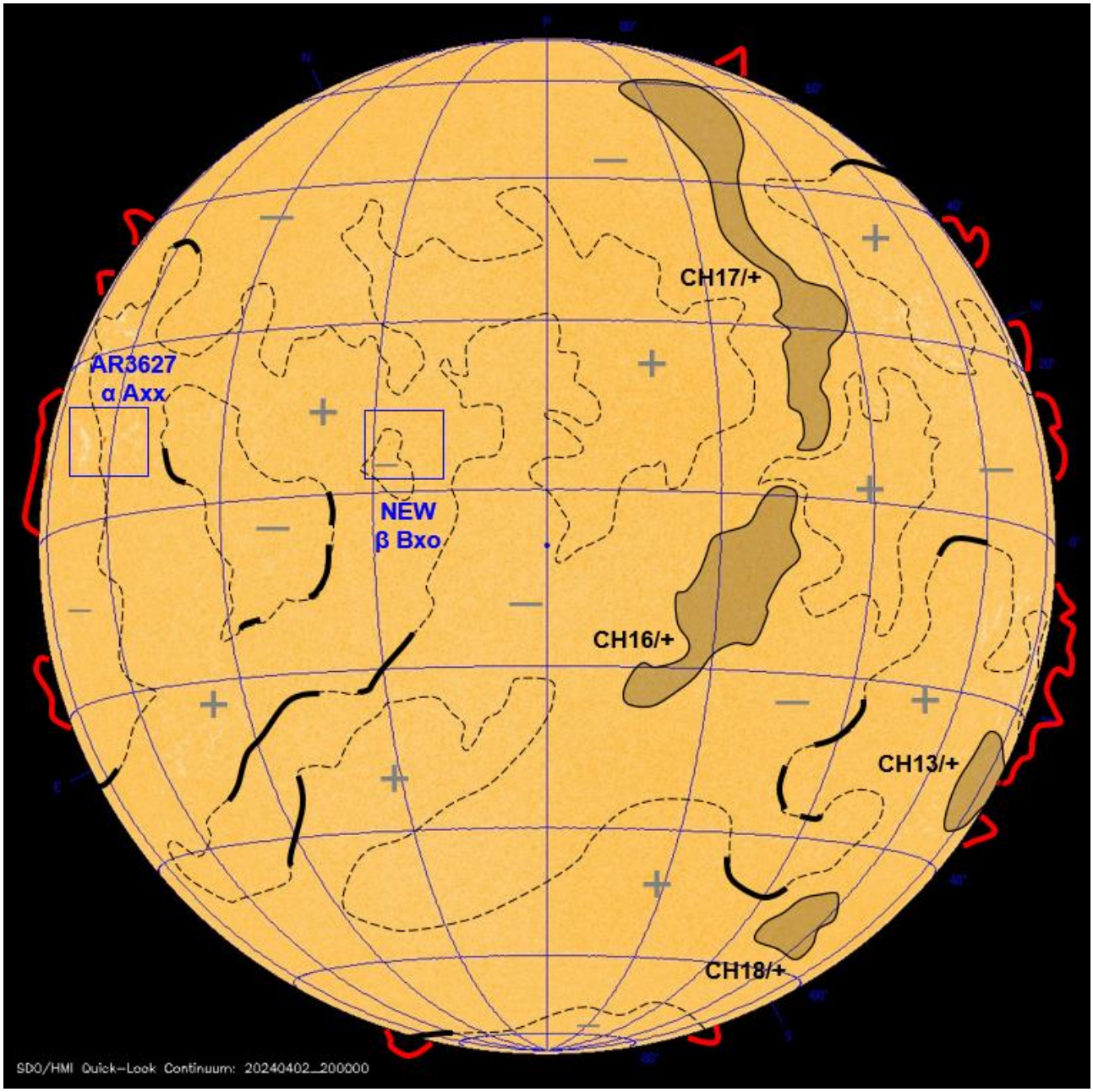
Figure 1. Solar Analysis Valid 02/2000UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

There are no Earth-directed CMEs currently expected.

Earth is currently seeing ongoing but fairly weak HSS influence, now most likely from positive polarity CH13/+ in the southwest. These winds look like to remain generally steady before the onset of a likely stronger coronal hole fast wind from negative polarity CH16/- and CH17/-. These are recurrent features, but much more prominent on this rotation. They are also more likely to give a geomagnetic response at this time of year than the current (positive) fast wind due to their negative polarity. An earlier arrival is expected compared to that indicated in either ENLIL model output or 27-day persistence, thought most likely later on Day 1 (03 Apr). Ongoing fast wind effects are then expected into Day 2 (04 Apr), before gradually easing later into Day 3 (05 Apr) with conditions currently expected to be returning towards background by Day 4 (06 Apr).

Geomagnetic activity is forecast to be initially Quiet on Day 1 but increasing into the day to become generally Active with a chance of G1 Minor Storm intervals due to the fast wind onset, this perhaps persisting into early Day 2, before gradually easing to Quiet to Unsettled with a chance of Active intervals.

Geo-Magnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	50	30	5	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Nil

Figure 2: Latest ENLIL Ensemble data showing expected HSS onset. Note ENLIL expected to have this onset delayed compared to reality based on analysis.

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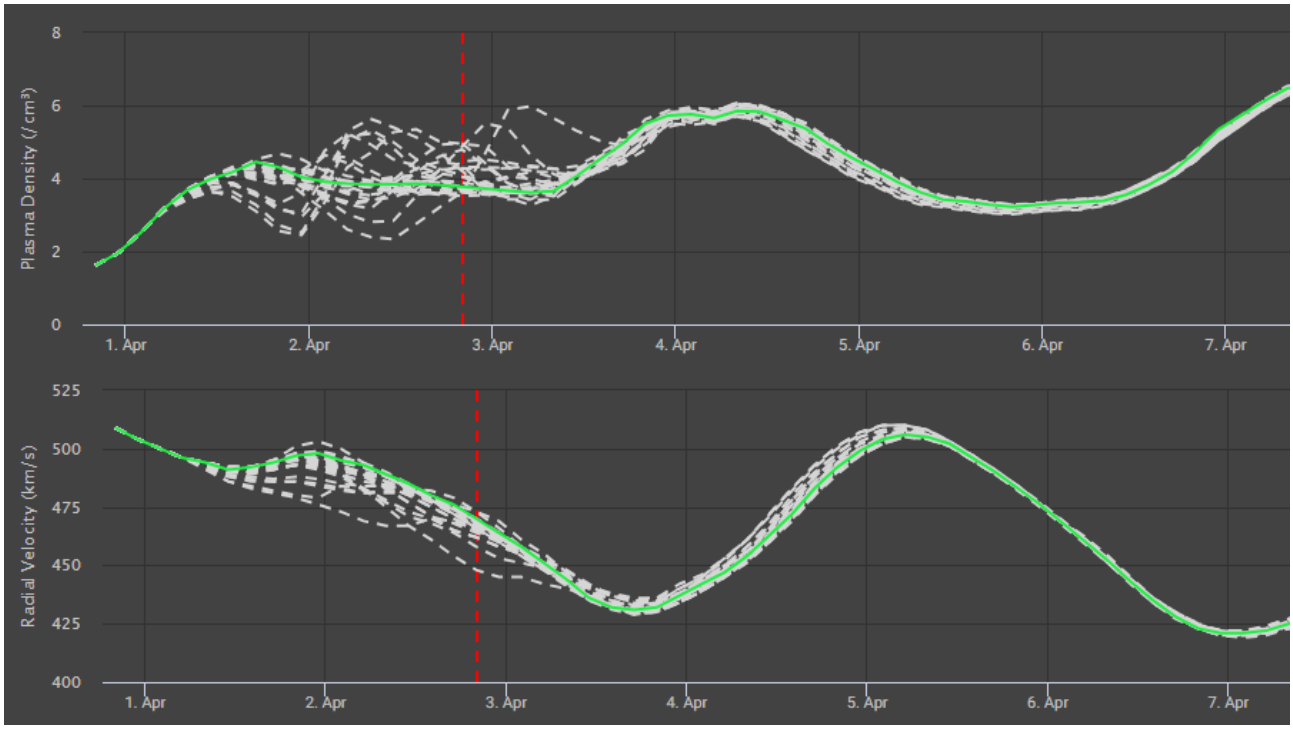

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Radio Blackouts - X-Ray Flares:

The flare risk from the departed AR3615 has now largely cleared, though the magnetic looping of the spot is still just about visible over the southwest limb. Very little activity now present on the current disk although signs of approaching regions beginning to round the eastern limb. These will be assessed as and when they become clearer. Ex-AR3612, which developed near the northwest limb and produced an M-flare as it rotated off, has the potential to return onto the northeastern limb into Day 1 (03 Apr). There are some indications of magnetic strength in a similar location on far-side helioseismic imagery, however this is low confidence.

Overall, a trend for activity to remain Low to Very Low is expected, but with a slight chance of isolated M-flares maintained given the unknown risk presented by approaching regions, this increasing by the end of the period.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	10	10	15	20
Very Active	R3 to R5 X Class	No	1	1	1	1

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Solar Radiation Storms - (High Energy Protons):
High energy proton flux observed by GOES-18 is now at background levels and expected to remain so, with none of the visible active regions currently expected to bring a risk of significant proton rich flares. Oncoming regions may be more active but are expected to remain in the less favorable eastern hemisphere throughout the period.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	1	1	1	1
Very Active	**≥ S3 ***	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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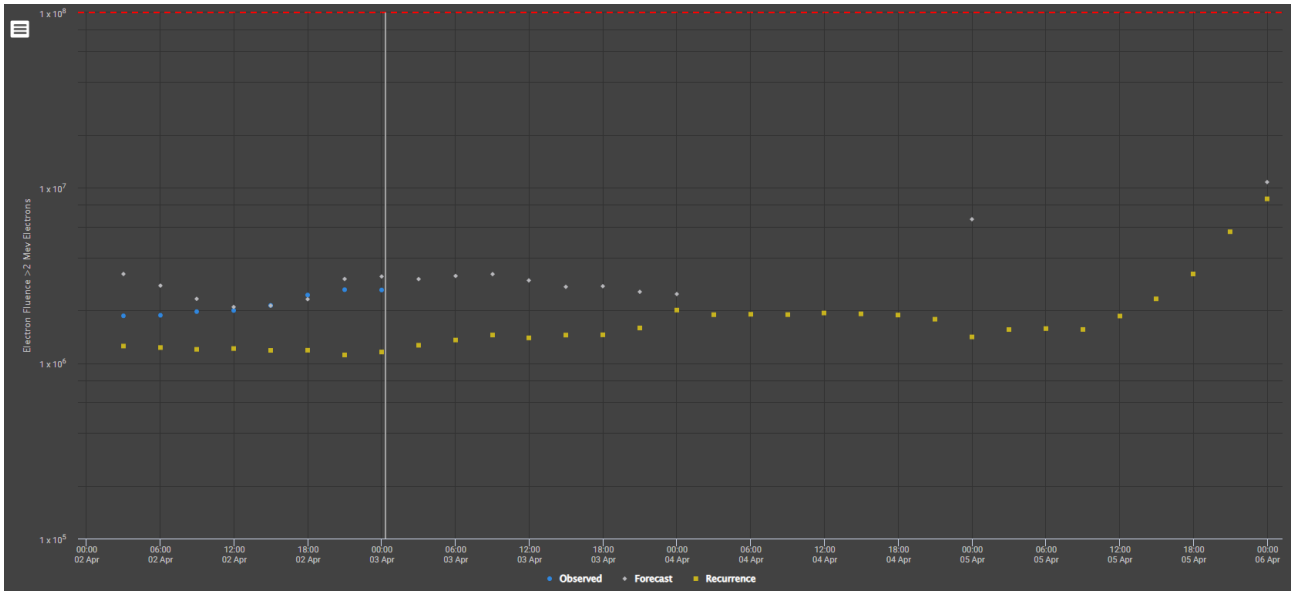
High Energy Electrons Event (≥ 2MeV):
GOES-16 high energy electron flux at GEO has persisted at background levels, with no significant enhancements expected until after the onset of any fast wind from CH16/17. Electron count rates perhaps climbing as a response into Day 3 or more likely Day 4 (05-06 Apr), potentially reaching Moderate to High levels by the end of the period as coronal hole influence likely fades.

The associated 24 hour fluence is expected to remain steady, well below the Active (1e8 integrated pfu) level, on Days 1-2, before rising gradually through Days 3-4. This will bring a chance of reaching the Active threshold by the end of the period. REFM is providing a good guide to current conditions, however detail later into the period remains unreliable until after any fast wind arrives at Earth and the impact can be assessed.

GEO Electron Environment	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ 2 MeV ≥ $1x10^8$	No	1	5	20	30
Very Active	≥ 2 MeV ≥ $1x10^9$	No	1	1	1	5

Figure 3: Latest MOSWOC REFM model output.



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